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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
09/898,815	07/05/2001	Shi-Chang Wooh	MIT-114J	3226

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EXAMINER
YAM, STEPHEN K

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 10/17/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/898,815	WOOH, SHI-CHANG	
	Examiner	Art Unit	
	Stephen Yam	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
4) ☐ Interview Summary (PTO-413) Paper No(s) _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Objections

1. Claims 4-7 are objected to because of the following informalities:

In Claims 4-7, "the acoustic wave" lacks proper antecedent basis, as there are several acoustic waves (longitudinal, surface Rayleigh, shear) that are generated. For examination purposes, Examiner interprets "the acoustic wave" to refer to any of the several acoustic waves.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claims 1 and 12, it is unclear whether the surface Rayleigh and shear waves generated by the excitation laser system is acoustical or optical, since a first interpretation of the claims leads to all three waves as acoustical in nature, while a second interpretation leads to only the longitudinal wave as having an acoustical property.

Regarding Claim 1, it is unclear whether the detection laser system merely detects the laser beam from the excitation laser system or actually emits a laser beam for interferometry purposes. Since the claim language does not mention the emission of a laser beam, Examiner interprets the detection laser system to merely detect and intercept shear waves.

Claims 2-11 and 13-19 are indefinite by virtue of their dependency on an indefinite claim.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-6, 8-15 and 17-19 are rejected under 35 U.S.C. 102(b) as being anticipated over Drescher-Krasicka US Patent No. 5,549,003.

Regarding Claim 1, Drescher-Krasicka teaches a defect detection system comprising (see Fig. 6a) an excitation laser system (22) (see Col. 2, lines 59-63) for projecting a laser beam at the near surface of a sample (24 in Fig. 6a, 42 in Fig. 6d) to be tested for generating acoustic longitudinal (56) (see Fig. 6d), surface Rayleigh (54), and shear (58) waves, a detection laser system (40) spaced from said excitation laser to intercept shear waves reflected from the far surface of the sample at approximately the angle of maximum shear wave propagation, and a detection circuit (62) for detecting the energy level of the reflected shear wave intercepted by said detection laser system representative of a flaw in the sample.

Regarding Claim 2, Drescher-Krasicka teaches (see Fig. 6d) the excitation laser system and detection laser system on the same side of the sample.

Regarding Claim 3, Drescher-Krasicka teaches a movable support (60) for said excitation laser system and detection laser system for moving them along the sample.

Regarding Claim 4, Drescher-Krasicka teaches the detection circuit including a shear wave sensing circuit (see Fig. 6a) for sensing the energy level (see Col. 12, lines 3-7) of the acoustic wave and the time of arrival (see Col. 11, line 66 to Col. 12, line 3) of the reflected shear wave at the detection laser system.

Regarding Claim 5, Drescher-Krasicka teaches the detection circuit including a first logic circuit for recognizing the presence of a potential flaw if the energy level of the acoustic wave sensed by the shear wave sensing circuit is less than a predetermined level (see Col. 12, lines 7-12).

Regarding Claim 6, Drescher-Krasicka teaches the detection circuit (40) (see Fig. 6d) including a surface Rayleigh wave sensing circuit for sensing the energy level (see Col. 17, lines 33-36) and time arrival (see Col. 7, lines 10-11) of the acoustic wave.

Regarding Claim 8, Drescher-Krasicka teaches the detection circuit including a scanning device for sensing the variation in the energy level of the reflected shear wave along the sample to create shadows of a flaw (see Col. 12, lines 19-22).

Regarding Claim 9, Drescher-Krasicka teaches a measuring circuit for measuring the length of each shadow cast by a flaw blocking shear wave propagation and the distance between those shadows (shown on screen as "black/gray pixels"- see Col. 12, lines 10-22).

Regarding Claim 10, Drescher-Krasicka teaches (see Fig. 6d) a positioning circuit (64) for determining the location, size, and orientation of a flaw.

Regarding Claim 11, Drescher-Krasicka teaches the defect detection system with the sample including steel (see Col. 7, lines 38-41) and the angle of maximum shear wave propagation being approximately 40° (see Col. 14, lines 40-45).

Regarding Claim 12, Drescher-Krasicka teaches (see Fig. 6d) a method of detecting a defect in a sample (42) comprising photoacoustically exciting acoustic longitudinal (56), surface Rayleigh (54), and shear (58) waves at a first point on the near surface of the sample, photoacoustically detecting (40) acoustic waves at a second point spaced from the excitation first point for intercepting shear waves reflected from the far surface of the sample, and detecting (62) the energy level of the intercepted reflected shear wave representations of a flaw in the sample.

Regarding Claim 13, Drescher-Krasicka teaches the excitation and detection occurring on the same side of the sample (see Fig. 6d).

Regarding Claim 14, Drescher-Krasicka teaches (see Fig. 6d) the excitation and detection points moved (60) along the sample.

Regarding Claim 15, Drescher-Krasicka teaches sensing the energy level of the reflected shear wave and recognizing the presence of a potential flaw if the energy level is below a predetermined level (see Col. 12, lines 7-12).

Regarding Claim 17, Drescher-Krasicka teaches determining the variation in energy level of the reflected shear wave along the sample to create shadows of the flaw (see Col. 12, lines 19-22).

Regarding Claim 18, Drescher-Krasicka teaches measuring the length of each shadow cast by the flaw (shown on screen as "pixels"- see Col. 12, lines 10-22).

Regarding Claim 19, Drescher-Krasicka teaches (see Fig. 6d) determining (64) the location, size, and orientation of a flaw from the size and separation of the shadows.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 7 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drescher-Krasicka.

Regarding Claim 7, Drescher-Krasicka teaches a defect detection system with an excitation laser system for generating acoustic longitudinal, surface Rayleigh, and shear waves, a detection laser system, and a detection circuit, as taught in Claim 6, according to the appropriate paragraph above. Drescher-Krasicka does not teach a second logic circuit for inhibiting recognition of a potential flaw if the energy level of the surface Rayleigh wave sensing circuit is less than a predetermined level. It is well known that a lack of surface Rayleigh waves indicates a rough sample surface, as the surface and shear waves would scatter along the ridges of the surface and not reflect towards the detection circuit. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a second logic circuit for

inhibiting recognition of a potential flaw according to a predetermined energy level of the surface Rayleigh waves in the defect detection circuit of Drescher-Krasicka, to recognize an uneven sample surface and prevent a false positive reading of a potential flaw that occurs when shear waves are not fully detected by the detection circuit.

Regarding Claim 16, Drescher-Krasicka teach a method of detecting a defect in a sample comprising photoacoustically exciting longitudinal, surface Rayleigh, and shear waves, photoacoustically detecting acoustic waves, and detecting the energy level of the reflected shear waves. Drescher-Krasicka does not teach sensing the energy level of the surface Rayleigh waves and inhibiting detection of a flaw if that level is below a predetermined level and confirming recognition if it is greater than the predetermined level. It is well known that a lack of surface Rayleigh waves indicates a rough sample surface, as the surface and shear waves would scatter along the ridges of the surface and not reflect towards the detection circuit. It would have been obvious to one of ordinary skill in the art at the time the invention was made to sense the surface Rayleigh waves to inhibit flaw detection according to a predetermined energy level in the defect detection method of Drescher-Krasicka, to recognize an uneven sample surface and prevent a false positive reading of a potential flaw that occurs when shear waves are not fully detected by the detection circuit.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lorraine et al. US Patent No. 5,801,312, teach a defect detection system with an excitation laser emitting Rayleigh, longitudinal, and shear waves, a detection laser emitting a laser beam to detect the emitted waves, and a detection circuit for detecting the energy level of the detected waves.

Lévesque et al. US Patent No. 6,128,092, teach a defect detection system with an excitation laser emitting Rayleigh, longitudinal, and shear waves, a detection laser, and a detection circuit for detecting wave energy levels.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (703)306-3441. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703)308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7724 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

SY S.Y
October 15, 2002

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